

B

UND

DR. T.



ON THE ESTABLISHMENT
OF A
BOTANIC GARDEN
AND
ARBORETUM
IN MONTREAL,

UNDER THE AUSPICES OF THE MONTREAL HORTICULTURAL SOCIETY AND FRUIT
GROWERS' ASSOCIATION OF THE PROVINCE OF QUEBEC.

REPRINT FROM 10th ANNUAL REPORT.

OFFICERS OF THE SOCIETY

For 1885.

DR. T. STERRY HUNT, President,

D. P. PENHALLOW, B. Sc., Vice-President.

H. S. EVANS, Secretary-Treasurer.

edit
1885

acqu
tatio
Parl
if su
esta
mos
Dom
aspe

grea
coul
dete
and
agai
take
the
deen
for t
local
Neg
lishn
prop
the n

estab
learn
izatio
the S

*S
and ar

BOTANIC GARDENS.

These articles were contributed by Prof. Penhallow, of McGill University, as editorials to the *Daily Star*, and appeared in that paper during the month of March, 1885, and will form part of the Annual Report of the Montreal Horticultural Society.

Among those who are fortunate enough to know our fair city, either by personal acquaintance or through indirect channels, Montreal enjoys a deservedly high reputation for her many attractions, not the least of which is our unequalled Mount Royal Park. It now appears that initiative steps have been taken in a movement which, if successful, will augment these attractions in a most important manner by the establishment of a botanic garden with suitable conservatories. The scheme is a most comprehensive one, and is of such importance, not only to the city but to the Dominion at large, that we feel it desirable to lay it before our readers in all its aspects.

It has long been felt by the Horticultural Society that Canada was placed at a great disadvantage among other nations, in not having a suitable garden where plants could be tested in their climatic adaptations, and their economic value accurately determined. This found expression in the annual report of the Secretary for 1880; and in his report for 1884, submitted at the annual meeting in December last, he again called attention to the necessities of the case, and hoped that action might be taken at some future date. At an early meeting of the directors, it was decided that the question was one of such importance, and the necessities so obvious, that it was deemed desirable to at once take decisive steps. A plan was therefore elaborated for the establishment of a botanic garden and arboretum, which, while distinct as to locality, should, in a measure, at least, be under the same general management. Negotiations were at once opened with the proper authorities, looking to the establishment of a garden for herbaceous plants, together with proper conservatories and propagating houses, in a central location. These negotiations are now pending, and the results will be announced in due season.*

Within a few days the city authorities have been approached with reference to establishing the arboretum on Mount Royal, as a feature of the Park, and it was then learned that a garden was contemplated in the original park plan, but that its realization has been delayed for want of funds to meet the expense. The proposition of the Society, however, met with such favor that a special committee from the Board

*Since this was written the plan has been somewhat modified, and the intention now is to combine both garden and arboretum in one, within the limits of the Park.

of Directors was invited to meet the Park Committee of the City Council on the afternoon of February 12th. A general statement of the proposed plans was presented, and important facts were cited to show the great value of such an institution both to the city and the Dominion. The Society was represented by Dr. T. Sterry Hunt, President; Prof. Penhallow, Vice-President, and David R. McCord, Esq. As the meeting was a preliminary one, no definite results were reached, but the interchange of views led to the subject being referred for more careful consideration at an early date, when it is to be hoped decided measures may be adopted for the proper execution of this most desirable scheme. The general features of the plan for the establishment of an arboretum are as follows:—

As the name indicates, it is designed to utilize a certain tract of land—we will say ten acres or more as necessity may require—for the growth of trees and shrubs, not only from all parts of the Dominion but from other parts of the world. The arrangement of all the different species and varieties introduced, should be such as to exhibit in the best manner, the natural relationships, and if, in addition to this, each tree and shrub has a suitable label, the whole garden will be a most valuable source of instruction to a very large class of citizens who could obtain the information in no other way. As a means of popular instruction, then, the arboretum would be invaluable, while it should also admit of very substantial advantages being derived by the various educational institutions of the city for the benefit of their students, since it is designed that the grounds shall be free to the public, as are other parts of the Park.

In its practical aspects, it is contemplated to make the arboretum a place where the climatic adaptations and economic values of plants may be accurately determined, and this at once displays a very large field of usefulness in which the whole of Canada has an interest, since by such means it will be possible to avail ourselves at comparatively short notice, and upon the basis of reliable and authoritative information, of numbers of trees and shrubs from other parts of the world which may prove of great value here as elsewhere.

Other directions of usefulness suggest themselves, and if in the future it should be found desirable to extend the functions of the arboretum beyond those indicated, it will be very easy to increase its usefulness by following somewhat in the same lines pursued by older establishments of a similar kind, such as those found all over Europe and in the Arnold Arboretum at Brookline, Mass. The distribution of seeds; the distribution of authoritative information as to the care of trees, the proper method of pruning, transplanting, etc., etc.; dissemination of information concerning improved methods of arboriculture; popular instruction in subjects relating to general horticulture; and as a repository of information for the benefit of gardeners, who could feel sure of gaining authoritative information on subjects connected with their calling; all these are directions in which an enlarged and legitimate, as well as very important field of usefulness may be found.

The history of similar institutions elsewhere, shows that their usefulness in all these directions is meeting with greater recognition and appreciation every year, and their importance as a means of popular instruction to a very large class of

people, who neither have the time nor money to spend in special education, is very great, and, as in the case of the Kew Gardens, is gaining greater recognition from this particular class.

The gardens at Kew, England, are without doubt the largest and most fully equipped in the world, and both in this and in the amount and character of the work performed, may be taken as the type which other gardens may well follow; we shall, therefore, in our endeavors to show good and substantial reasons for the establishment of a similar institution here, have frequent occasion to cite the results which are now being obtained at Kew; not, however, that we aspire to surpassing or even equalling them, but that so far as the special needs of this country and climate are concerned, efforts should always be directed towards them as the standard which it might be possible to realize.

The question of maintenance is a very important one in this connection. An establishment of this character requires to be independent, while at the same time the interests of the public demand that the grounds should be open to all without restriction, and that there should be no necessity for resorting to the sale of produce for a revenue. It is very essential that there should be nothing of the nature of a commercial enterprise, and whatever material is distributed to other gardens or to the city, should be in the nature of exchanges, and this would bring ample compensation in new material for planting. To secure this, it is essential that a fund should be provided, from which a reliable and adequate revenue could be drawn.

GARDENS OF THE WORLD.

The first question which naturally arises in dealing with a problem of this kind is, is there a trustworthy precedent? The answer is to be found in the example which most of the civilized nations of the earth have already set us, and in which ample justification will be found for all that is contemplated in the plan now proposed for Canada. From the most trustworthy information at hand, the various countries of the world have been classified according to the botanic gardens which they support, as follows:

1. Germany, 32; II. Italy, 24; III. France, 22; IV. Austria, British Islands and immediate dependencies, Russia, 12 each; V. British India, 9; VI. Belgium, 6; VII. Switzerland, 5; VIII. Australia, Cape Colony and Natal, Holland, Scandinavia, West Indies, 4 each; IX. Portugal, United States, 3 each; X. Algeria, French Indies, Roumania, Spain, 2 each; XI. Brazil, British Guiana, Canary Islands, Chili, Denmark, Dutch Indies, Egypt, Equador, Guatemala, Greece, Hong Kong, Japan, Mauritius, New Zealand, Peru, Philippines, Servia, Siberia, Tasmania, 1 each; XII. Argentine Republic, Canada, Colombia, Mexico, Paraguay, Turkey, Uruguay, Venezuela, none.

It is thus seen in the first place, that Canada is placed in a most unenviable position as compared with the other progressive nations, since she is forced into the list with those nations of least enterprise and in the lower scale of civilization. She even stands lower than Japan.

In the long list of gardens—one hundred and eighty-seven in all—here given, there is abundant evidence that they must serve a most useful purpose, and what their value is, we shall see later on. But it is interesting to note that in Germany, the country which leads the world in science, there are not less than thirty-two gardens, or 17.1 per cent. of the whole number, and there must be very substantial reasons indeed, reasons which are not based upon sentimental views, to lead such an eminently practical people to maintain so many similar establishments at a large annual outlay. In Europe, these gardens are divided between educational institutions—chiefly universities—and the State. In the former case they are maintained because of their value in technical education; in the second case they are supported to promote special industrial interests, and in both cases they serve a most important purpose as a means of popular education and as mere ornamental grounds. In the United States, of the very meagre number of properly established botanic gardens there found, one is maintained at Washington by the Central Government, for experimental and ornamental purposes, while the other two, the garden at Cambridge and the arboretum at Brookline, belong to Harvard University; and they serve a most important purpose, not only in technical education of a high order, but in the diffusion of knowledge of the greatest practical value to the country at large. In other countries, as in the tropics, the gardens are not generally connected with educational institutions, and their functions are of a more practical nature, since they are designed chiefly to test the economic values, and determine the characteristics of the plants growing in that region, thus permitting the acquisition of exact knowledge in much shorter time and with greater reliability than would be possible otherwise.

As one of the largest of the British colonies, occupying a very important geographical position, and with most important and extensive resources which demand an accurate knowledge of plants with reference to climatic adaptations and economic value, Canada should at least be on a par with the other colonies, and should be able to effect interchange of desirable vegetable growths with all other countries where similar climatic conditions obtain, but as the case actually stands, she is to-day behind even the most remote colony of Oceanica, and cannot claim equality with Japan, a country which is generally considered to have been half civilized until within a very few years, but which, notwithstanding, maintained a botanic garden for a number of years before the present European contact. It may be urged in this connection that no other colony has an equally severe climate, and this we are disposed to grant, but as will appear later, this fact does not constitute an actual obstacle. To be sure, we cannot adopt the same methods or reap the same advantages as in tropical countries where vegetation is more spontaneous, nor can we expect so rich a collection as would be possible in England, but the character of the vegetation, as well as its distribution in Canada, most conclusively show that a botanic garden would have as legitimate purpose and definite value for the necessities of this country and climate, as elsewhere. Indeed, it may with reason be urged that the necessity of a garden is fully as great, if not greater, as we proceed farther north into those latitudes where the range of desirable species is more limited, and in consequence of which it becomes important to secure as many valuable exotics from similar climates as possible.

Another argument which might very properly be brought forward in this connection, is to be found in the relations between institutions of this character and the advancement of a people in culture and all the higher elements of an advanced civilization. The influence which springs from the habitual contemplation of and reflection upon natural objects is well defined and is known to be a most important factor in individual education ; and where beauty is one of the chief elements in the object, the effect must be of a high order. Thus, through the individual, the national character is directly effected in a way and with a strength which legislation would be powerless to accomplish, and if we push this argument to its logical conclusion, we at once see that, other things being equal, the number of gardens and similar institutions supported by a people becomes a direct index of their degree of civilization. An examination of the classification given makes this obvious, as also does the history, both ancient and modern, of those nations which have at various times led the world.

From the facts and statements here presented, therefore, it is obvious that in justice to herself, Canada can hardly afford to do less than those nations over whom she claims superiority, while her interests actually demand that she should be among the foremost of nations in her maintenance of such gardens.

EDUCATIONAL VALUE.

Of the one hundred and eighty-seven gardens of the world, it appears that at least fifty-eight, or 31 per cent. of the whole number, are directly connected with and maintained by educational institutions, most of which rank as Universities. This may be taken, therefore, as a direct measure of their value and importance in higher education. Of the remaining sixty-nine per cent., however, we must bear in mind that, while maintained chiefly for practical results, many of them undoubtedly afford valuable means of instruction to students of those colleges and smaller institutions, which could not maintain gardens for themselves, so that we may reasonably consider their value in this direction more properly represented by a much higher percentage.

The requirements of the present day necessitate a broad and liberal foundation in education, no matter in what particular direction a man's tastes or circumstances may afterwards lead him in the choice of a profession, and now that we are slowly beginning to recognize the superior advantages of more practical methods in education, and of that system which, through its practical methods, will best fit a man to cope with the general problems of life, we have to admit the natural sciences as most important features of our system. For the general student, no less than the future specialist, a botanic garden thus becomes a most important element in liberal culture. By its collections from various parts of the world, it gives the student a new insight into nature and tends to most healthy mental expansion. To the intending specialist, it is the source of material which could be obtained elsewhere only with great difficulty, if at all.

Aside from their more special value for the education of students, they are indirectly of great service to the public at large, through the opportunities which they afford for gardeners of all kinds to gain fresh and valuable information concerning their occu-

pation. They are repositories of reliable information and advanced methods, and an intelligent gardener is sure to derive great benefit from them, not only from observation of the plants grown and their particular arrangements, but he is able to secure at first hand, definite and reliable knowledge with reference to the proper treatment of trees and plants in all respects, and for a country with large forestry interests to care for, this is a most important consideration. In various parts of Europe, where the care of forests is conducted upon scientific principles, and placed in the hands of a suitably educated person, all such details as pruning, transplanting and the treatment of disease are regarded as matters of great importance, which must be carefully looked after. And thus, while it may not be a necessary function of a garden or arboretum to give special instruction in such matters, yet it can exert a most potent influence in this direction, in a quiet way and without special effort.

Kew, however, affords a most valuable example of what such a garden may do in educating gardeners to a better understanding of their calling, while the results of their work also demonstrate, not only the need for consideration of the necessities of this class, but the appreciation with which it is received at their hands, as well. For some years it has been the custom there, to hold classes two evenings in the week during nine months of the year, for instruction in elementary chemistry, physics and meteorology. The attendance has been good from the first, but according to the official report, it would appear that in 1880, these lectures had become so popular in meeting an actual want, that the accommodations were insufficient to meet the demand.

A third aspect of the educational value of such institutions in any community, is to be found in their influence upon the public at large; and this comes not only through rendering scientific work and names popular, but through a constant moral and social elevation. The habit of reflection, which unconsciously springs from the frequent contemplation of natural objects, particularly when the prevailing laws are well defined, engenders higher ideals, a clearer moral perception and a less morbid disposition, and there is thus a constant tendency to turn men from the commission of deeds which are a disgrace to humanity, to the performance of that which is worthy of a noble manhood. It is unquestionably true that, in communities having frequent access to such institutions, there is the greatest intelligence and refinement, and we doubt not that, no more certain means of reducing the long list of crimes now annually recorded, could be adopted, than by gradual education of the lower classes through popular channels of this kind. If we examine the record of annual visitation at Kew, we will doubtless see this more clearly. Taking four years at random, we find in 1879 a total visitation of 569,134, which, from unusual causes, represented a decrease over the previous year, of 156,288. In 1880, there was 723,681, or an increase of 154,547 over 1879. In 1881, there was an increase of 112,995 giving a total of 836,676; while in 1882, there was an increase of 407,490, giving the surprising total of 1,244,166 visitors for the year. Furthermore, the maximum visitation for any one day in the four years, was 95,300; the average daily visitation for the whole period was 2,310, and for the year 1882, it was 3,409.

We next turn to the special bank holidays of which there are four mentioned in the official report, in order to determine what particular class is affected and to what

exte
incr
desi
the
is a
rang
95,3
spee
was
the r
from
incre
that
will
perce
incre
these
in a v

throu
as ca
by th
which

turne
parts
of hig
are ne
garde
to, it
of a r
distrib
them
outco
serve
the fl

the co
Medic
botan
Fores

ods, and an
om observa-
to secure at
reatment of
ests to cere
, where the
hands of a
e treatment
efully looked
r arboretum
influence in

n may do in
e results of
ecessities of
as well. For
in the week
physics and
to the official
r in meeting
emand.

community, is
nes not only
stant moral
ngs from the
ling laws are
a less morbid
e commission
ich is worthy
ving frequent
ment, and we
now annually
asses through
ation at Kew,
n, we find in
ed a decrease
an increase of
total of 836,-
rising total of
n for any one
whole period

mentioned in
ed and to what

extent. It is safe to say that upon such special days of freedom, any particular increase in number of visitors, would represent directly the very class it is most desirable to reach, viz., the clerks, artisans, etc., etc. And we may, therefore, take the visitation at such times as practically an index of the degree to which this class is affected. For each of the four bank holidays, therefore, the visitation in 1880 ranged from 864 to 61,831; in 1881 from 1,131 to 50,688, and in 1882 from 1,460 to 95,300 in a single day. If we then examine the relation which this visitation on special days bears to that for the same year, we get the following values; for 1880 it was 16.2 per cent.; 1881, 17 per cent., and for 1882 it was 18.4; and these figures are the more impressive, since we find with increasing visitation each year, the visitors from the working class not only held their full percentage proportion, but actually increased from year to year at the rate of about one per cent. If we now bear in mind that these gardens are but one-twelfth of all similar institutions in Great Britain, we will realize that they appeal to a very large constituency, of which a very considerable percentage represents the class which it is most desirable to reach. Also, the annual increase in number of visitors is a most convincing proof, not only that the work of these gardens is meeting with increased appreciation, but that their efforts are directed in a way which appeals to and meets the popular wants.

SCIENTIFIC VALUE.

Aside from their specific value in promoting the diffusion of scientific knowledge through the education of students, botanic gardens may very properly be regarded as capable of exerting an important influence upon the advancement of pure science, by the encouragement to original research which they offer, particularly in those which are liberally endowed, and thus able to embrace a wide field of usefulness.

One of the first and most obvious directions in which their efforts may thus be turned, is to be found in the exact determination and classification of plants from all parts of the world. It thus becomes one of the most imperative duties of a garden of high order, to give authoritative information concerning, not alone plants which are new to science, but those which are new to the particular region in which the garden is situated, as well, since such classification is a most necessary preliminary to, it is in fact a basis of, other knowledge of a more practical character. The plants of a region once accurately described; their peculiar habits of growth, geographical distribution and particular associations carefully determined, all other facts concerning them will follow in natural order and have far more significance. As a necessary outcome of such studies, large herbaria gradually accumulate and ultimately come to serve as most important means of reference, when questions arise with reference to the flora of a given region, whether from a purely scientific or practical point of view.

As the direct outcome of concentrated advantages thus placed at the disposal of the competent student, we may cite such important works as Bentley & Trimen's *Medicinal Plants*; Watson's voluminous *Flora of California*; the various works on botany by Dr. Gray; the invaluable *Tenth Census Report* by Prof. Sargent, on the *Forestry of North America*, and the indispensable *Genera Plantarum* of Bentham

and Hooker; and while we unhesitatingly admit the great value of such works, we cannot but feel that their realization would be very difficult, were it not for the special facilities for such work afforded by the gardens at Cambridge, U.S., and Kew, England, from which they have emanated.

A second direction of scientific utility, is readily found in promoting study and research in those fields where the results obtained ultimately come to have a definite practical value in their application to the solution of questions bearing upon important industries; and this is chiefly to be found in the encouragement to, and opportunities for researches in vegetable physiology. It is not essential or desirable that a botanic garden should assume the functions of an experiment station proper—although in one sense it is such—but in questions of a purely botanical nature, it offers a stimulus to the prosecution of such researches, which might not be found elsewhere. It is, first of all, desirable to keep in mind that all botanical questions, however practical it is desirable their ultimate bearings may become, must first of all be approached in their scientific aspects. When these are clearly understood, the application of the principles thus made clear, follows naturally and with comparatively little difficulty. Thus studies relating to the potato disease, diseases of fruits, grape mildew, the coffee disease, and many others of a similar nature, may be cited as conspicuous examples. All of these, however, first require to be dealt with from a purely scientific point of view, as the exact knowledge thus obtained affords the only certain basis for further operations to combat and overcome. But we are well aware that the ultimate bearing of such studies must have a most important industrial aspect, as is readily seen in the case of the coffee disease, where a large and most important industry is threatened with destruction.

The rapid denudation of vast areas, through consumption of the timber which once covered them, is already leading to many interesting and difficult problems for solution. As a means of checking the disastrous results which may well be anticipated from this cause, attention is being directed to the special planting and care of trees, and to the better care of those yet undisturbed. The natural outcome of this has been a careful and scientific study of trees, with reference to the best methods of repairing injury and treating the diseases to which they are subject. Germany has already made great progress in this direction, and we may reasonably expect other countries to follow at no distant day. Here again, we have the purely scientific and the practical meeting on common grounds. Important practical results are achieved, and large industries are directly effected through the application of principles derived from scientific methods in the consideration of each particular case, and all these must be regarded as springing primarily from the stimulus and opportunities afforded by gardens and similar institutions.

These facts then, may be taken as indicating the direction in which such institutions may be of great scientific value, particularly where there is a practical application in the end. It would hardly be wise to expect one garden to actually undertake all the work here indicated, and, indeed, it is apparent that to do so would require an extensive plant. Each garden should actually undertake only such parts of this work as is justified by the requirements of its location and the strength of its

resources. The facts brought forward, however, render it fairly clear that, however much the functions may be limited to one or more of these lines of usefulness, the garden must exercise a very sensible and important, though silent influence, in every direction.

PRACTICAL VALUE.

The value of a botanic garden, so far as practical results are concerned, may be considered from several standpoints. Perhaps the first and most obvious of these is found in the distribution of seeds and plants. In this connection, we may reasonably suppose this material to be first of all distributed to various parts of the country in which the garden is located, and for which it essentially becomes the testing ground. We thus may have valuable shade or timber trees quickly brought to the notice of a very large constituency through channels which give the information thus conveyed, the full weight of authority. After these wants are supplied, the surplus material will readily find ample outlet in distribution to more remote countries, where it will be likely to have specific value. We may also assume with reason, that this distribution does not alone concern those plants which have been introduced and found to be adapted to the climate and popular needs, but that it involves indigenous species, through the wide dissemination of which, by such means, the native flora becomes more generally and favorably known. Usually such distribution takes the form of exchange, by which means the least burden of expense is imposed upon all concerned, while it also secures reciprocal advantages. Examples of this are to be found in all the larger and older establishments of this kind, now found in various parts of the world.

In certain cases, when the garden derives a measure of support or other substantial advantages from the city or district in which it is located, it may offer an equivalent by supplying such trees as may be required for street purposes, and bedding material for public grounds, thus directly extending its value as an educator of the public, in a way which will bring the most permanent good to the greatest number. In these respects, as in so many others, the gardens at Kew have set an example which may well be followed by all others. From the official reports, it would appear that for the four years from 1879 to 1882 inclusive, there were distributed 8,703 packages of seeds; 20,167 stove and greenhouse plants; 4,817 herbaceous plants, and 12,458 trees and shrubs, to a total of 730 recipients. If we bear in mind that the parties receiving this material were in all parts of the world, we will at once perceive the far-reaching and great value of this work. Individuals frequently receive their share, but the larger portion constantly and primarily goes directly to other centres for study, propagation, trial and redistribution. It appears, however, that during the latter three years of this period, the London parks were directly benefitted by this distribution, since 7,730 trees went to them alone. Cities, as a rule, are far too deficient in shade trees for the public health and comfort, and in this one direction alone, gardens may accomplish much good.

The special interchange of trees and plants, with a view to directly utilizing whatever desirable qualities they may possess, presents a second phase of the practi-

cal value of such gardens. This we at once recognize if we call to mind the resources now placed at the disposal of the landscape gardener through the introduction of valuable ornamental plants from abroad. What is true in this respect, is also equally true in the case of those plants which are the source of valuable timber; which yield valuable fruit; which possess important medicinal properties, or which serve as the source whence is obtained valuable textile, cordage or paper material. The results of Mr. Gibb's efforts for the introduction of Russian fruits into Canada, offer a very strong argument in favor of our statement. In fact, such interchange at once opens up a very wide and important field of usefulness.

Each year witnesses important additions to our economic plants, and doubtless many still remain to be discovered to the general public. Such acquisitions, however, require to be carefully and systematically tested, not only in their climatic adaptations, but in the direction of their special applications. Were it not for this the introduction of new plants might be left largely in the hands of the horticulturists; but men of this class, following such a business for a livelihood, have little time or inclination, and far less preparation for the work required. They rather depend upon seeking their knowledge of the plants they raise, from authoritative centres.

Yet another aspect of the question, is found in the possibility of distributing the knowledge thus obtained, with all the weight which authority can give. The particular mode of distribution may be largely determined by circumstances. Special publication should be issued, as is frequently the case; or by consultation and observation on the part of those desiring special information, or by means of correspondence. The best evidence to be adduced in support of these statements, is to be found in the work actually performed in this direction.

During the four years from 1879 to 1882 inclusive, the gardens at Kew issued, or were the direct means through which their preparation and publication were realized, no less than fifty-eight (58) separate works, some of them of a very voluminous character, conveying the information there accumulated concerning a great variety of subjects. At the same time, correspondence and special examinations, or the results of continued observations upon trial plants, have been published from time to time, and thus has been given a very wide distribution of information upon a great variety of subjects and of the most valuable character.

An idea of this may be gained from the following summary for 3 years, in which the figures indicate number of plants examined or number of reports made, or both together. We thus have, woods and timbers, 14; textiles, 7; paper materials, 20; food products, 34; perfumes and oils, 8; diseases, 7; fodder plants, 13; resin and wax, 5; India rubber, 39; medicinal plants, 23; dyes, 1; poisonous plants, 1; sundries, 5. In conclusion, it is only necessary to direct attention to the very important bearing which this information has upon large commercial enterprises, since it deals directly with the distribution, adaptation and special value of plants and trees, which are the source of mahogany, india rubbers, gutta percha, chinchona alkaloids and their substitutes, indigo, textile and paper materials and important food products, no less than with the diseases which often exert a most serious influence upon many of these industries.

CONCLUSION.

Any question which may have arisen with reference to our being too far north for a garden to meet with success, has already been met in a general way in our previous considerations, and it only remains to point out that gardens are successfully maintained in other parts of the world, where the climatic conditions are equally severe. We find that there are gardens at Christiana, Stockholm, Upsala, St. Petersburg, Kasan and Moscow, as well as at Helsingfors; let us, then, institute a comparison with these places. Montreal is situated in about $45^{\circ}30'$ N. lat.; while Christiana, Upsala, Helsingfors and St. Petersburg lie close along the parallel of 60° N. and Stockholm at about $59^{\circ}20'$. Latitude alone, however, does not afford a safe means of comparison, as is well known, since other considerations have an important modifying influence upon the climate of particular localities. The mean annual isotherm of Montreal is 41° F., and this is found to pass through Christiana and Stockholm, but considerably to the south of St. Petersburg, Helsingfors and Kasan, and somewhat to the south of Moscow. Quebec, in a latitude of about $46^{\circ}49'$, and thus more than a degree north of Montreal, lies in the mean isothermal line of 36° F. This latter passes well to the north of Christiana and Stockholm, but passes directly through St. Petersburg. It then bends to the south and passes somewhat to the north of Moscow, but well to the south of Kasan. From this it appears that there are at least two gardens in climates as cold or colder than Quebec, while there are no less than six gardens successfully maintained in climates of equal or greater severity than that of Montreal.

The growing season usually opens, in the vicinity of Montreal, the first week of May, and it continues well into the autumn, thus giving five months duration to the vegetative period. Within that time growth is rapid, and a varied flora is developed. Moreover, it is a well known fact that, owing to the very considerable warmth of our summers, it is quite possible to bring to maturity, Indian corn, peaches, grapes and other fruits which it is not possible to ripen properly in any of the places here compared, or even in England. It thus becomes reasonably clear that, no serious difficulty is to be met with here in climatic severity.

It is probably true that no other city of the Dominion can claim so many important educational institutions, representing so wide a range of interests as Montreal; and thus, as the educational centre of the country, it becomes highly desirable, if not a necessity, that a garden should be established here. More than that, also, its position in many respects, makes Montreal a natural centre for all such purposes as the acclimatization of plants. Trees and shrubs grown here will be able to meet the slightly colder climate of all such more northern places, where they would be likely to be grown, without injury. Any location farther south and west, would be of much less value, as the plants would then be adapted to warmer climatic conditions, and would not be adapted to the more northern localities for which they might be needed. Plants grown in Montreal could be safely distributed throughout the Dominion.

We may now briefly recapitulate our main points, to show concisely in what particular direction good may be expected from such an institution :—

1. In its relations to the public at large, it will serve as a means of popularizing botanical science, while at the same time it will afford a most invaluable means of recreation and instruction to the laboring classes, and its final effect must be a gradual elevation of the public sentiment.

2. In its relation to special education, it will serve a most important purpose both in technical and general instruction. If the present plans are successfully executed, the garden will be so located and so managed, that all the educational institutions of the city may derive an equal measure of benefit upon common grounds.

3. In its relation to the city, there should be no difficulty, under proper arrangements and in return for advantages such as land, etc., in the way of supplying the city with such plants as are needed for bedding-out purposes, and such trees as are required for the streets, which at present are altogether too destitute.

4. In its relation to the Dominion at large, the garden may directly become a valuable centre of information, and, under proper conditions, even a centre of experimentation. That it will exert a most important influence upon Dominion interests goes without the saying; since such a garden, unless its efforts are confined to exceedingly narrow limits, must, in the necessary fulfilment of its purpose, extend its influence even beyond the boundary line of the country in which it is located. We may therefore expect forestry and its dependent industries, and whatever pertains to the cultivation and care of trees and plants, to receive important benefits. Beyond this, as already shown, important industries must be largely influenced and promoted by the information which it is within the power of such an institution to distribute.

Finally, we may venture to suggest that such undertakings are not to be successfully prosecuted without the sinews of war, which, in this case, appear as dollars, and it is earnestly to be hoped that the general public will so far appreciate the need of such a garden here, that the efforts now being made, will meet with substantial financial encouragement from the city, the province, the Dominion, and even from private individuals.

concisely in what

s of popularizing
valuable means of
effect must be a

important purpose
are successfully
the educational
upon common

proper arrange-
of supplying the
ch trees as are
e.

rectly become a
centre of experi-
minion interests
are confined to
purpose, extend
ch it is located
d whatever per-
portant benefits
y influenced and
an institution to

not to be success-
ar as dollars, and
ciate the need of
substantial finan-
ven from private